DOCUMENT RESUME

ED 236 030 SE 043 311

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TITLE The Learner's Way and the Teacher's Way. A Whole-Staff Workshop on Student Learning Difficulties. Learning in Science Project. Working Paper No. 55.
INSTITUTION Waikato Univ., Hamilton (New Zealand).
PUB DATE Oct 82
NOTE 39p.; For related documents, see ED 226 976, ED 229 442, ED 230 594, ED 235 011-030, SE 043 285-302, and SE 043 305-315. Document contains some marginal legibility.
AVAILABLE FROM University of Waikato, Science Education Research Unit, Hamilton, New Zealand.
PUB TYPE Reports - Evaluative/Feasibility (142) -- Reports - Research/Technical (143) -- Guides - Non-Classroom Use (055)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Comprehension; *Concept Formation; *Curriculum Development; Elementary School Science; Elementary Secondary Education; Learning; Science Education; *Science Instruction; *Secondary School Science; *Teacher Workshops
IDENTIFIERS *Learning in Science Project; *New Zealand; Science Education Research

ABSTRACT

This workshop is based upon work and findings of the Learning in Science Project, a research project which investigated problems and difficulties in the teaching and learning of science. The workshop program, including activities which have been shown to impact on teacher thinking, is designed to focus attention on learning problems in classrooms, stimulate thinking about student perceptions in learning, and share in Learning in Science Project findings. Activities include: (1) a survey of ideas children have about phenomena/events; (2) investigating behavior of particles; (3) reviewing responses to the survey; (4) reviewing the investigation of particle behavior; (5) small group examination of five learning problems (lessons viewed as isolated events, student perceived purpose of tasks not same as teacher's purpose, students' perceptions of activities do not include understanding of critical design features which teachers assume they do, views students hold in connection with ideas associated with a particular activity/lesson, students do not see significance of their activities in ways that teachers assume they do); and (6) large group discussion of the five problems. Survey of ideas questionnaire, answer sheets, and other workshop materials are provided in appendices. (JN)

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LEARNING IN SCIENCE PROJECT

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THE LEARNER'S WAY AND THE TEACHER'S WAY

A whole-staff workshop on student learning difficulties

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University of Waikato
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WORKING PAPER No.55

THE LEARNER'S WAY AND THE TEACHER'S WAY

A whole-staff workshop on student learning difficulties

Ross Tasker,

October 1982.

> "after a while I started to understand it ... how to write some things ... and how some things got like that ... but having been taught by a teacher one way I tend to relate it the same way but in my own words and my own thinking ... in an exam I would probably get it wrong, but I could still think of it that way ... (You see) when we are told to swot for a test we have got to swot in one book all the stuff the teacher's way ... we go home and we try to learn that, but as soon as it hits our eyes it goes in our brain and goes the other way ... and so when we come to write it down and we think ... and write it down all our way - because, of course, it still means the same thing, there is a distinct difference between our way and the teacher's way ... and the teacher's way is the right way ... that is what I find hard ..."
>
> (Paul, aged 15 years)

INTRODUCTION

This workshop is based upon work and findings of the Learning in Science Project (LISP)[1]: a research project which investigated problems and difficulties in the teaching and learning of science. The LISP research focussed on the science learner in the science classroom. However, there are issues associated with learning difficulties exposed by the research which relate to learners of any subject and in any classroom. It is these issues which this workshop attempts to address.

The programme of the workshop has been based on activities which have been shown to have impact on teacher thinking. The activities were designed originally to be used in in-service situations with science teachers. However they have also been found to have relevance for a wider audience.

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[1] The Learning in Science Project was funded by the N.Z. Department of Education for three years (1979-81). It was based in the University of Waikato. In 1982, action-research teams of teachers responded to research findings by exploring classroom solutions. Detailed information on the LISP can be found in the N.Z. Science Teacher, (1982), Nos. 33, 34 and 35.

As developed in this paper the workshop forms the morning programme of an in-service day for the whole staff (see Appendix 6, suggested Workshop Timetable).

THE WORKSHOP

Introductory Talk

The aims of the workshop need to be published in a introductory session. These aims are:-

1. To focus attention on learning problems in (YOUR SCHOOL) classrooms.
2. To stimulate thinking about pupil perceptions in learning.
3. To share the Learning in Science Project findings.

In introducing these aims, brief reference needs to be made to the nature and work of the LISP: it obviously would be useful for someone with first-hand knowledge to do this. However, the references given (see footnote 1, p.1) provide ample information to make this not a prerequisite. It is important that this session is very brief (5-10 minutes). In relation to the LISP, it should be stressed that the research focussed on the learner in the classroom and that the activities which form the workshop involved practising teachers in their development and evaluation.

Activity One — A survey of some ideas

The LISP developed a number of surveys which were ways of finding out the ideas that children have about various phenomena and events, (e.g. force, condensation) and about the meanings that children have for certain words (e.g. animal). These surveys were developed from intensive interviewing of pupils and are useful ways of spotting learning difficulties; for they do not simply establish whether or not a pupil has the scientific idea, but rather establish just what idea a pupil does have. Knowing how pupils are thinking is a powerful platform from which to provide learning experience.

In this first activity, workshop participants are put in a learning situation. The workshop venue becomes a classroom. Participants are each given 'A survey of some ideas' and one answer sheet (see Appendix 1). Observe normal classroom 'test' conditions for this activity (no copying and no discussion) but be supportive. Emphasise that the survey is personal, individual performance will not be made public; the objective is to find out the ideas of each participant in relation to things of interest to science teachers. Participants use the answer sheet to indicate their ideas, this should be named or code numbered, and is collected. Once collected answer sheets are handed to the marking team (see Appendix 5, Preparation for the Workshop). The survey is kept.

Activity Two — Investigating the Behaviour of Particles

Immediately the answer-sheets to the Survey of some Ideas have been collected the workshop needs to be divided into three groups. These groups should be as similar as possible. Each group should have a similar range in terms of age, sex, subject expertise etc. Hence the groups need to have been established by the workshop team prior to the in-service day. Each group is then taken by a workshop team-member to a laboratory or room and introduced to Activity two. Different scenes to the activity are set for each group.[2]

Group One

i) The worksheet investigating the behaviour of particles is given to each 'pupil'. (see Appendix 2(a)).

ii) The activity is introduced in a very succinct way ... 'you are going to carry out an activity in which you will be investigating the behaviour of particles'. The title of the activity is then written on the blackboard.

iii) The 'class' is told where in the lab (room) the various items of equipment and material are located.

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[2] In this development of Activity two, different treatments are given to the three groups of participants that are established. This approach may provide additional information and suggest possible teaching strategies for dealing with learning problems. However, it does add to the preparation involved in the workshop and requires three people to lead the groups. The primary role of this activity in the workshop will not be compromised if the groups receive the same treatment (say treatment two). So if you are short on resources here is an opportunity to reduce the programme.

iv) The 'class' is then instructed to individually carry out the activity as per the worksheet.

While the class is carrying out the activity only questions relating to the location of equipment and material are answered. Questions relating to method and ideas involved are turned back to the 'pupil'.

Group Two

i) ii) and iii) as per Group one.

iv) Items of equipment and materials are displayed. The method of the investigation is discussed with particular features and techniques being demonstrated. Questions on method are invited and answered as clearly as possible.

v) The 'class' is then instructed to individually carry out the activity as per the worksheet.

During the activity, questions relating to method or techniques are answered as well as those relating to location of equipment and materials. Questions relating to ideas of what is happening are turned back to the 'pupil'.

Group Three

i) ii) iii) and iv) Group Two.

v) A brief talk is given on ideas about particles. In this talk particle models for matter are referred to (see diagram of O.H.P. transparency, Appendix 2(b)). The model is matched to the physical properties of solids, liquids and gases; various properties of matter being demonstrated e.g. liquids pour, gases compress. Finally the particle models are considered in relation to dissolving (see diagram of O.H.P. transparency, Appendix 2(b)). Questions are invited and answered briefly but clearly.

vi) The 'class' is then instructed to individually carry out the activity as per the worksheet.

During the activity all questions, whether they relate to equipment, techniques, method of investigation or ideas associated with what is happening in the beakers are answered.

As each group completes the investigation the survey 'Investigating particle behavoiur' is administered (see Appendix 2(c) and (d)). This survey is similar to that used in Activity one in that it has been designed to expose ideas held rather than identify whether or not thinking matches the scientific viewpoint. Ideas relating to the structure of matter, the nature of the investigation and what is happening when a solid dissolves in a liquid are covered.

Once again participants keep the survey but hand in their answer sheet for marking. This marking needs to be done immediately, the three groups' responses need to be kept separate as initial collation considers each group as a separate entity.

Activity Three — Reviewing Responses to 'A Survey of Some Ideas'

Once Activity two is completed participants are gathered together for a review of responses to the 'Survey of some ideas'. Each participant receives their own answer-sheet back. Beside each item participants will find a number; this number represents the percentage of the workshop membership that share the view indicated by the response. In addition for every item one of the choices (a,b, etc) will be marked; these marked choices are those expected if decisions have been made from a scientific prospective.

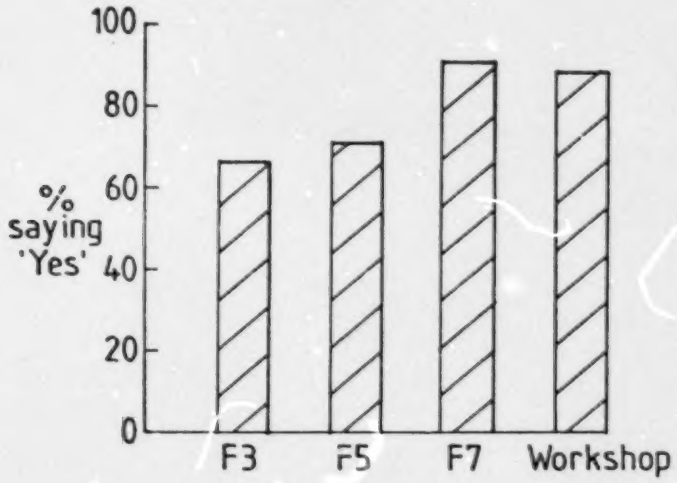
There are many ways in which this review can be handled. Whatever approach is used it is important that the central issues are not lost in a wide ranging discussion. These issues are;

1. That a range of ideas exist about things; things that are basic to learning situations in classrooms, and
2. Specialist ideas are frequently different from everyday ideas.

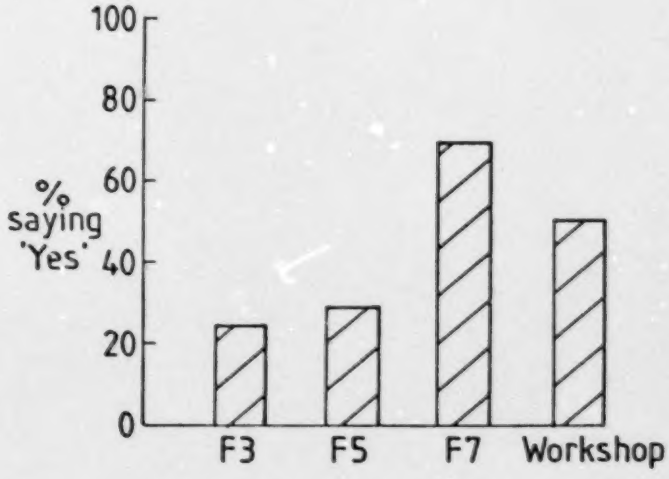
It is possibly best to simply present the data in a way which emphasises the two central issues and plan to provide a whole group discussion session as the last activity of the workshop. The data from the surveying of Form 3, 4 and 7 pupils (see Appendix 5, Preparation for the Workshop) provides a powerful framework for the presentation of the workshop answers. For example,

1) Individual questions can be considered. For example, at Tokoroa High School the following references were obtained and used in the Workshop.

(a) Question 2 : Is a person an animal?



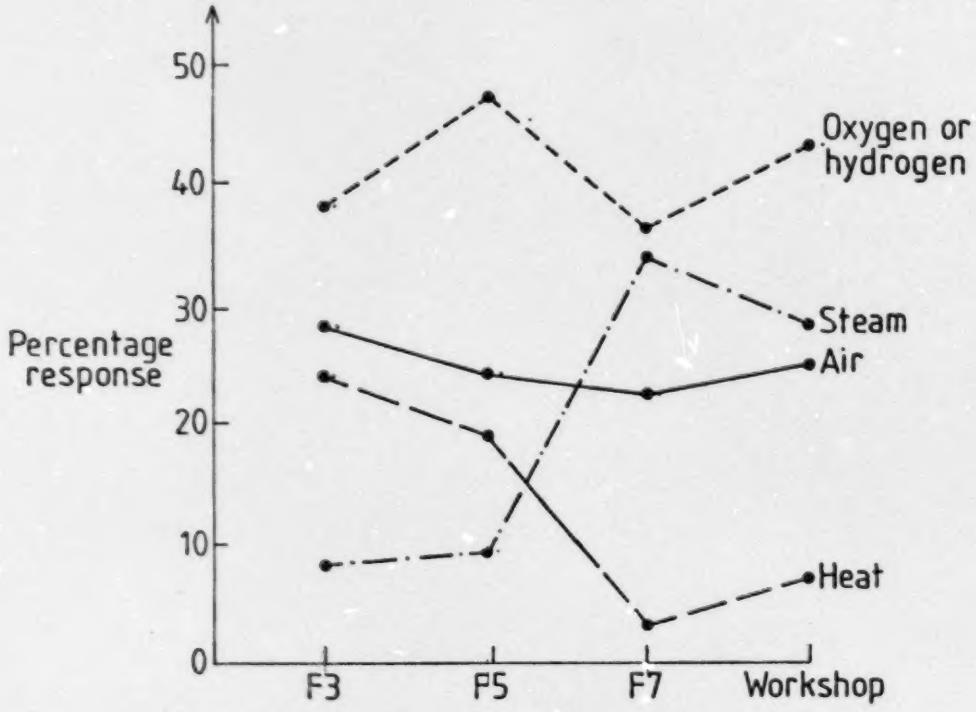
(b) Question 3 : Is a spider an animal?



Responses to Questions 2 and 3 can be compared. If the same scales etc. are used and different colours employed then O.H.P.s of the above data can be overlaid.

(c) Question 17 : What are the bubbles made of?

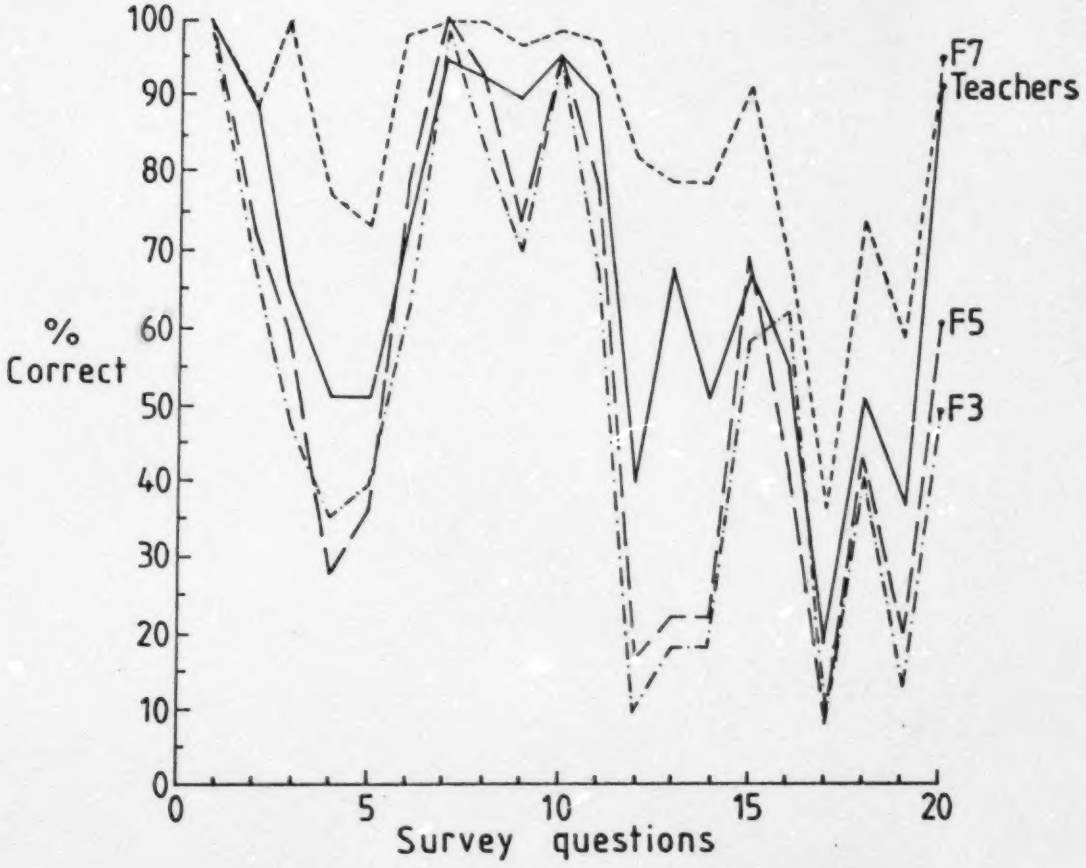
Note that here, in contrast to Questions 2 and 3, four choices are available and this requires a shift in presentation format.



(d) While all questions will provide the basis for considerable discussion (particularly when comparisons are drawn) questions 5, 6, 9, 12, 13 and 19 together with those used as examples are perhaps especially illuminating.

Whichever questions are used, there will be no difficulty in establishing the central issue of a range of ideas being typically held about things that are basic to classroom topics.

(e) An overview of ideas held can be presented by showing the percentage of responses for the various groups (F3, F5, F7, and Workshop) that match the scientific idea. Although you will need to be guided by the data you collect, using O.H.P. transparencies and overlaying the four sets of data (workshop data last) will provide much of interest.



This set of data will enable the second central issue to be strongly reinforced.

Activity Four — Review of 'Investigating the Behaviour of Particles'

The framework for this review needs to be established. This will involve:

1) Explaining the attempt to create three equivalent groups.

2) Setting out the three treatments.

As with the previous review, participants are given back their answer sheet to the survey. These will have been marked by indicating the 'teacher' expected choice for each question. Collected data is then presented to the workshop. A logical development would be Group 1, then Group 2 and finally Group 3. As before some clear strategies are possible using O.H.P. transparencies and overlays.

	a	b	c	d
1.	**6**	0	9	3
2.	6	5	**7**	0
3.	**13**	2	0	3

Denotes 'teacher' expected response

	IMPORTANT	NOT IMPORTANT	UNSURE
a	18	0	0
b	4	14	0
c	4	14	0
d	18	0	0
4. e	12	6	0
f	4	**14**	0
g	17	1	0
h	7	11	0
i	17	1	0

	a	b	c	d
5.	3	**13**	2	
6.	1	0	0	**17**

Note: Group 2 and Group 3 responses could be added to this framework using different coloured numbers.

When the results of the three groups are brought together and considered in terms of similarities and differences, it is likely that the following difficulties in learning in classroom situations will be able to be developed.

1. Lessons are perceived by many learners as isolated events. They do not consider specific aspects of the lesson against important prior experiences.
2. The lessons's purpose is not understood by many learners. They invent what seems to them to be a reasonable purpose.
3. Design features of a lesson are not appreciated by many learners; they are quite unaware of which aspects of the lesson need particular attention and why.
4. Teachers make wrong assumptions about the views many learners hold.
5. Learners frequently do not see the significance of their lessons in the way teachers think they do.

Undoubtedly, a wide range of issues could be developed at this stage of the workshop. Decisions will need to be made in this regard; experience suggests that much of what participants will want to discuss will find an opportunity for consideration in the next activity.

Activity Five — Considering Problems in Learning

In this activity the workshop is again split into groups. This time, group size should be 6-8. Again each group should contain a balance of sex, curriculum expertise, experience in teaching, likely contribution etc. It is best if these groups have been formed on paper by the workshop team before the in-service day.

Five problems are organised for consideration. These are set out in five discussion sheets (see Appendix 3 (a) to (e)). The five problems are, in effect, elaborations of the five points of difficulty that are suggested as emerging from Activity four. Each group is given two problems to consider. The groups should do this in private. Set a time limit for the activity and make sure each group is aware that a plenary session will follow and hence of responses to the discussion questions should be kept.

Activity Six — Plenary Session - Problems in Learning

After the set time for consideration of their two problems, all groups join together for a general discussion on the five problems. This can be handled in a variety of ways but at some point the discussion should be allowed to broaden into a wrap-up of the whole workshop. As discussion nears an end all workshop participants should be given a copy of the summary sheet (see Appendix 4).

CONCLUDING COMMENT

The problems in learning given emphasis in the suggested development of the various workshop activities are real and important barriers to learning in science classrooms, the LISP work established that. The response of teachers of non-science subjects who have considered these problems in the context of the workshop suggest that the problems may well be general problems of learning in classroom situations. Evaluation of the workshop at Tokoroa High School (its a good idea to do this about a week after the in-service day) gives confidence that the workshop is provocative and illuminating. Teachers there stressed the need for 'Departmental' follow-up sessions and without some follow-up the impact of the working will undoubtedly fade.

The workshop has been written up for secondary situations. However, it is considered that primary in-service programmes could usefully include the workshop.

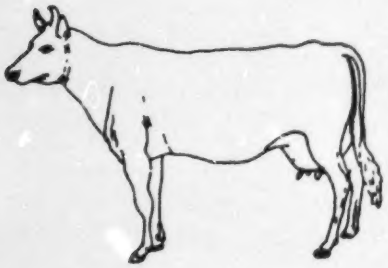
The aim of the workshop is to open up issue for discussion and give some direction to teacher thinking about the learners' world. It is encouraging to note that where school staff's have taken the step to use the workshop this aim would seem to have been achieved.

POSTSCRIPT

The framework for the Workshop was developed at Tokoroa High School by John Lambert, John Grant and Brian Woolhouse. The activities that are used to focus participant thinking have been taken from material produced by the Science Activities Action-Research Group of the Learning in Science Project.

APPENDIX 1(a): A survey of some ideas (after LISP)

The following questions are about the word animal.

1. 

Is a cow an animal?

(a) Yes

(b) No

2.

Is a person an animal?

(a) Yes

(b) No

3. Is a whale an animal?

(a) Yes

(b) No

4.

Is a spider an animal?

(a) Yes

(b) No

5.

Is a worm an animal?

(a) Yes

(b) No

The following questions are about the word <u>living</u>.

6.

Is a fire living?

(a) Yes

(b) No

7.

Is a person living?

(a) Yes

(b) No

8.

Is a moving car living?

(a) Yes

(b) No

The following questions are about the word plant.

9.

Is a carrot a plant?

(a) Yes

(b) No

10.

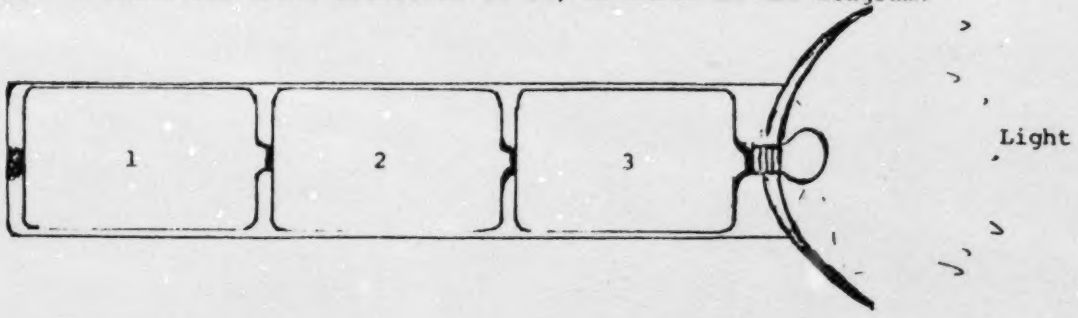
Is a tree a plant?

(a) Yes

(b) No

The following questions are about electric current.

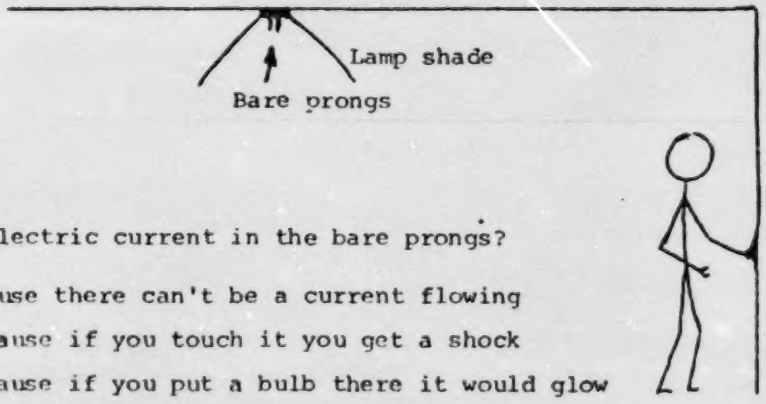
11. A torch has three batteries in it, as shown in the diagram.



The torch is switched on and the lamp is glowing.
Five students all have different ideas about the electric current through the batteries. Which one of the following ideas do you think is the best idea?

(a) No. 1 will have the most current
(b) No. 2 will have the most current
(c) No. 3 will have the most current
(d) No. 1 and 3 will have more current than No. 2
(e) They will all have the same current

12. This question is about an ordinary electric light which is fixed to the ceiling. The light bulb has been taken out, but the switch on the wall is on.

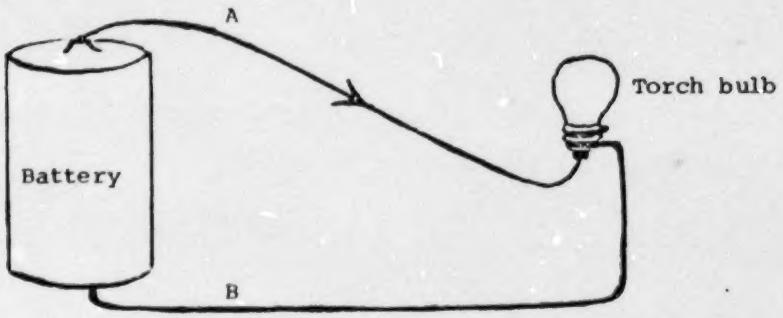


Is there an electric current in the bare prongs?

(a) No, because there can't be a current flowing
(b) Yes, because if you touch it you get a shock
(c) Yes, because if you put a bulb there it would glow
(d) Yes, because the current would be going out from the prongs

The following information is for question 13 and 14.

A battery is connected to a torch bulb as shown.



The bulb is glowing and the electric current in the wire marked A is shown by the arrow pointing from the battery to the bulb.

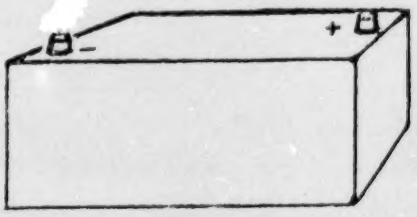
13. Which of the following is the best sentence about electric current in wire B?

(a) There is no electric current in wire B.
(b) There is some electric current in wire B but less thar in wire A.
(c) There is the same electric current in wire B as in wire A.
(d) There is more electric current in wire B than in wire A.

14. Which of the following is the best sentence about the direction of electric current in wire B?

(a) The current has no direction as there is no current.
(b) The current is in the direction from the battery to the bulb.
(c) The current is in the direction from the bulb to the battery.

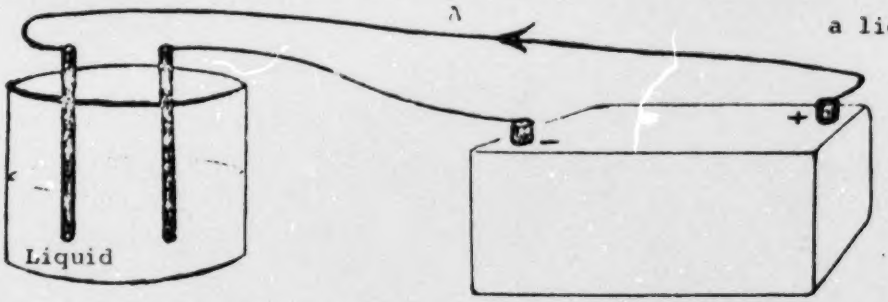
15. A car battery has been fully charged but has not yet been placed in the car. It is sitting on the bench in the garage and is not connected up to anything.



Is there an electric current in the battery?

(a) Yes, because it is all charged up.
(b) No, because it is not connected up to anything.

16. Two metal rods are connected to the terminals on a battery. The rods are in a liquid, as shown.



There is an electric current along wire A from the battery to the metal rod. Would there be an electric current in the liquid?

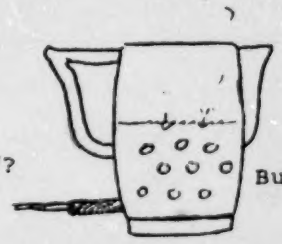
(a) It depends on what the liquid is.

(b) There must be a current in the liquid.

(c) There would not be a current in the liquid.

The following questions are about things that happen in the kitchen

17. When a kettle boils there are large bubbles in the water.



What are the bubbles made of?

(a) Air

(b) Steam

(c) Heat

(d) Oxygen or hydrogen

18. If a wet saucer is left on the bench after it has been washed then after a while it is all dry.

What happens to the water that doesn't drip onto the bench?

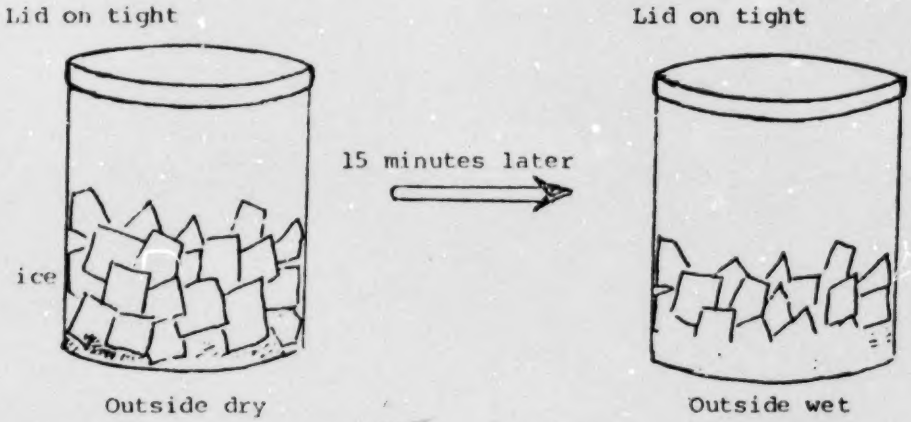
(a) It goes into the saucer.

(b) It just dries up and no longer exists as anything.

(c) It changes into oxygen and hydrogen in the air.

(d) It goes into the air as very small bits of water.

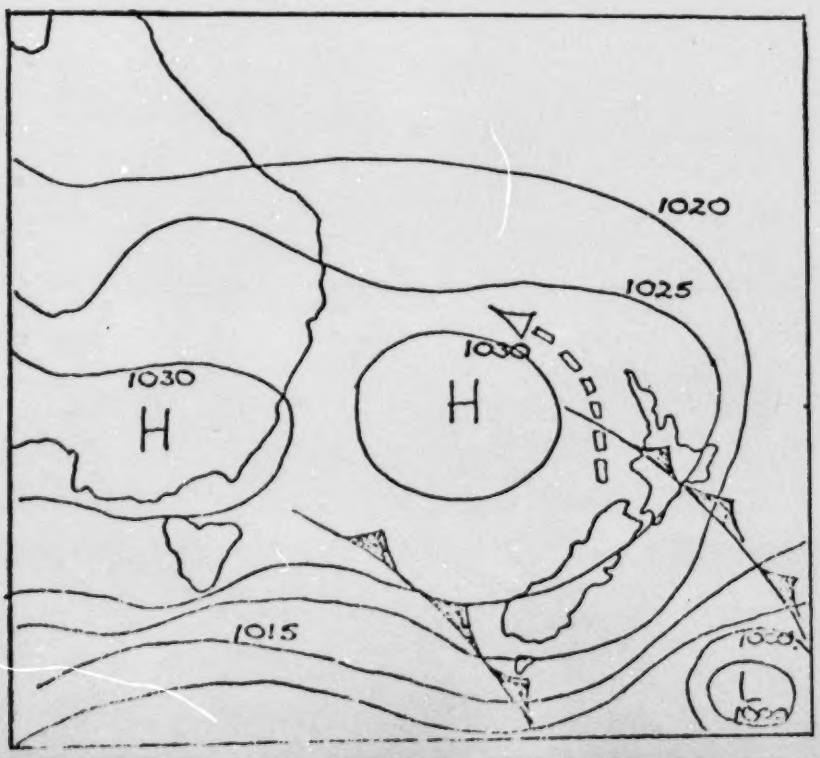
19. A small jar is filled with ice, the lid is screwed on tightly, and the outside of the glass is dried with a tea towel. Fifteen minutes later the outside of the jar is all wet.



Where has the water on the outside of the jar come from?

(a) The water from the melted ice comes through the glass
(b) The coldness causes oxygen and hydrogen in the air to form water
(c) Water in the air sticks to the cold glass
(d) The coldness comes through the glass and turns to water

20. The following diagram is a weather map.



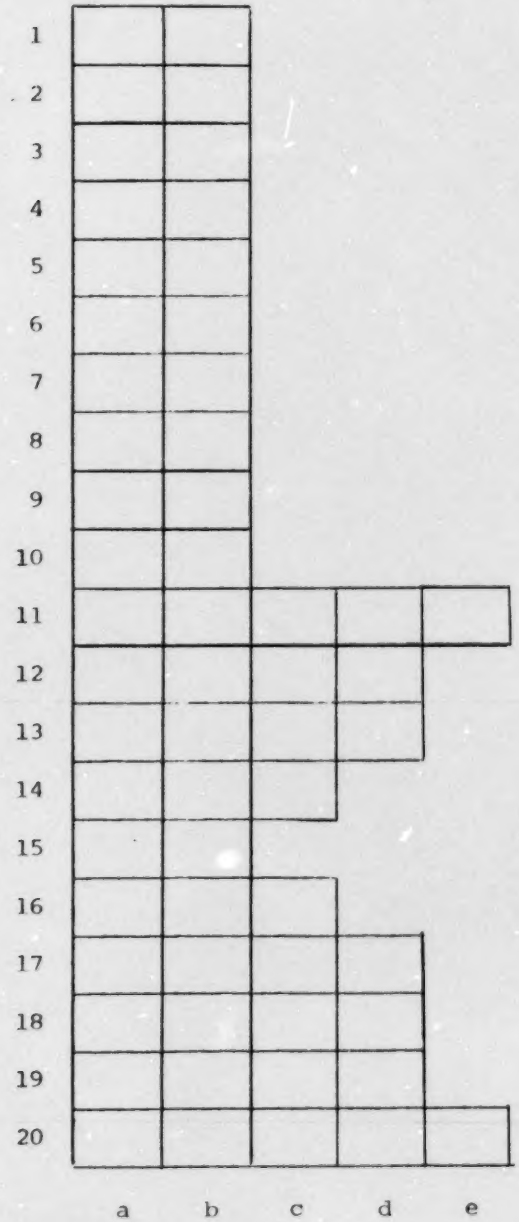
The big letter H mid-way between Australia and New Zealand shows:

(a) high winds
(b) high pressures
(c) hot temperatures
(d) heat
(e) humidity

APPENDIX 1(b): Survey of some ideas : Answer sheet

NAME OR CODE: _____

Mark the square that represents the best answer.



Be careful not to photocopy answers!

A scientists' choice is:-

1 - a	6 - b	11 - e	16 - b
2 - a	7 - a	12 - a	17 - b
3 - a	8 - b	13 - c	18 - d
4 - a	9 - a	14 - c	19 - c
5 - a	10 - a	15 - b	20 - b

APPENDIX 2: Investigating the behaviour of particles

Appendix 2(a): A worksheet (after Petchell)

3.5 Investigating the behaviour of particles

You have already seen some of the things that the particles making up crystals can do when they move from solution back to the solid state again.

In this investigation, if you use some crystals whose particles are strongly-coloured you will be able to observe how they move when they go back into solution.

Equipment needed: beaker of hot water, beaker of cold water, Condy's crystals.

Make sure the water has settled and is not moving at all. Drop one large crystal into each beaker. Watch carefully. What happens to the Condy's in each beaker to start with?
What happens to the Condy's in each beaker after a while?
What was the most important difference between the beakers to start with?
What do you think was the most likely cause of the different results?

In your notebook:

(a) Write the heading.
(b) Draw a diagram of the two beakers. Carefully shade in the Condy's to show how it looked at the end of five minutes.

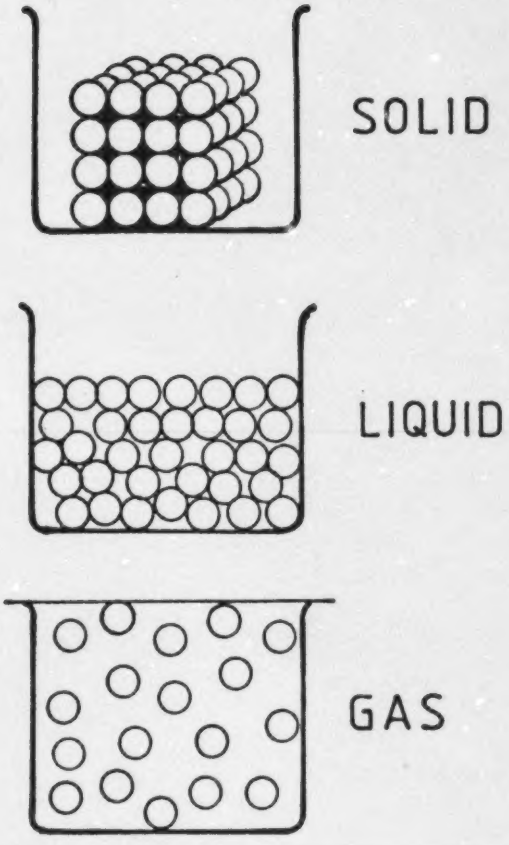
Copy and complete these sentences:

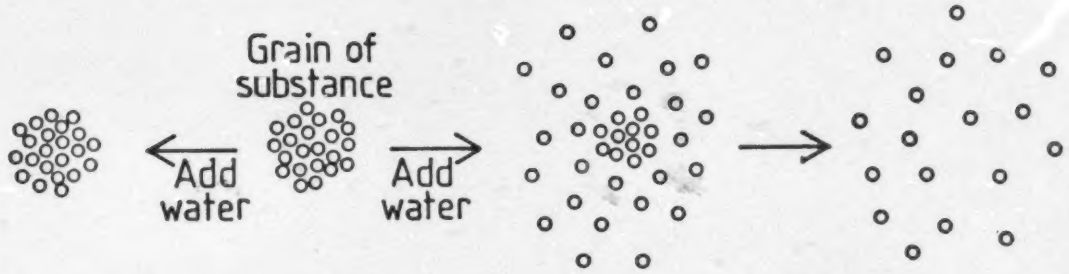
(c) I think particles in water (can, cannot) move about.
(d) These particles move (more easily, not so easily) if the water is hot.

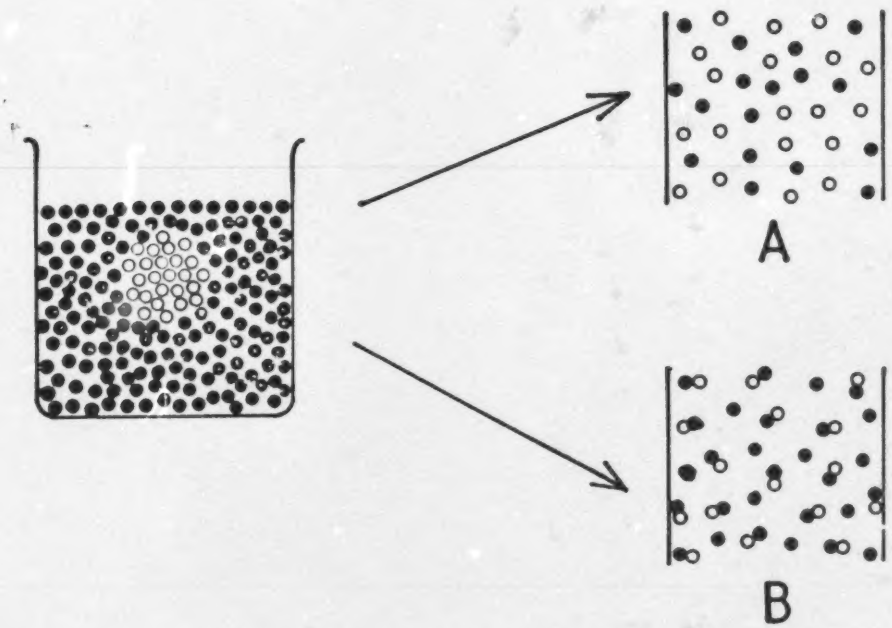
Questions to discuss:

Particles, like other objets, cannot move unless they are supplied with energy. How can the different amount of movement in the hot and cold beakers be explained?

APPENDIX 2(b): OHP Transparencies which could be used with Group 3 in Activity Two



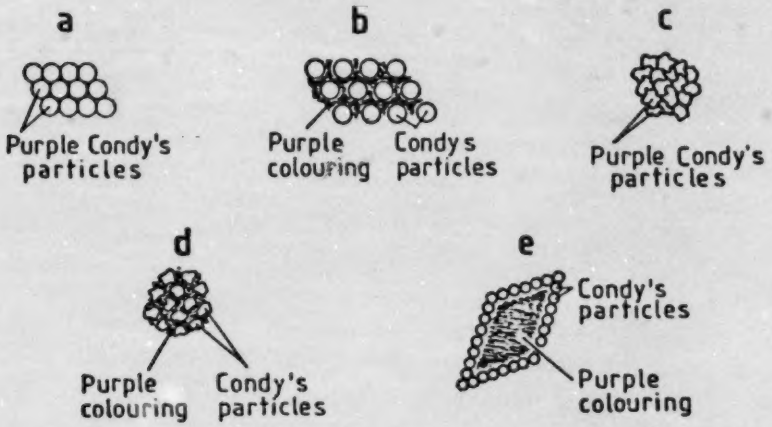

Grain of substance
Add water
Add water


A
B

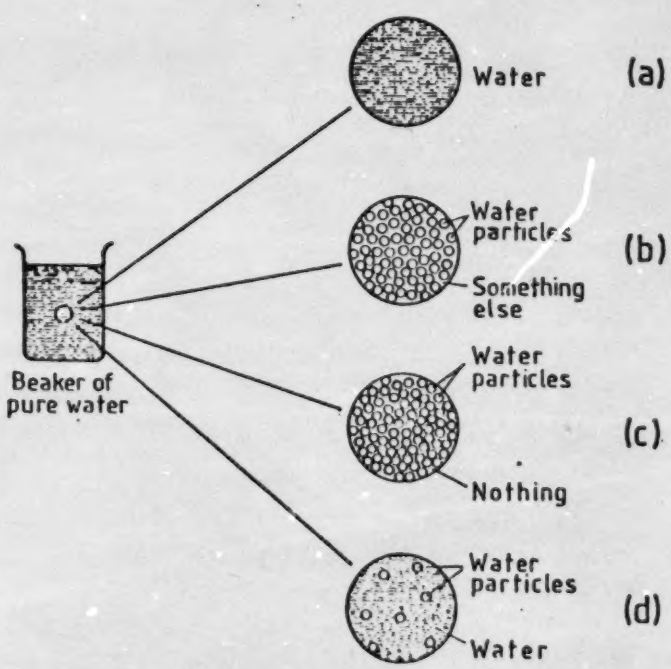
APPENDIX 2(c): Survey "Investigating Particle Behaviour" (after LISP)

The following questions are about the activity in which Condy's crystals are dropped into two beakers, one of hot water and one of cold water.

No. 1 Think of a Condy's crystal as it is before it is dropped into water. Your picture of the particles in Condy's crystals would be closest to which of the following drawings?



No. 2 Your picture of pure water in its finest detail, would be most like which of the following drawings?



No. 3 In your view, the purpose of this investigation was

a) To find out the effect of heat on the behaviour of particles.
b) To find out if Condy's crystals will dissolve in both cold water and in hot water.
c) To find out if both hot and cold water are able to take away the colour from the particles that make up Condy's crystals and if hot water does it best.
d) To find out what happens when the particles making up a Condy's crystal move into solution.

No. 4 How important are the following things in this experiment? (Important, Not Important, Unsure)

a. The crystal needs to be coloured.
b. The two beakers used must be the same size.
c. The two beakers must be filled with the same amount of water.
d. One beaker must have hot water and the other beaker must have cold water.
e. The crystals added to the two beakers must be the same size.
f. The cold beaker must be kept well away from the hot beaker.
g. The two beakers have to be able to be seen through.
h. The crystals should be added to both beakers at the same time.
i. The crystals must not be added until the water in both beakers is settled.

No. 5 Which of the following ideas best fits the way you think about what is happening when a Condy's crystal is dropped into the water?

a. The Condy's crystal sinks to the bottom and the purple colouring in it is slowly squeezed out by water pressure.
b. The particles of Condy's crystal go into the water as the crystal breaks up, and these Condy's particles make the water look purple.
c. Particles of Condy's crystal go into the water and allow the purple colouring to escape from inside the crystal into the water.

No. 6 Four pupils who did this experiment wrote up their thinking about the water as follows. Which one is most like how you think?

a. Water itself <u>is not</u> made up of particles but particles of other substances move faster in hot water than in cold water.
b. Water itself <u>is not</u> made up of particles but when it is heated, particles of other substances can move easily through it.
c. Water itself <u>is</u> made up of particles and these particles can move about more easily once a colder substance dropped in water is heated up.
d. Water itself <u>is</u> made up of particles and these particles are moving faster when water is hot than when water is cold.

APPENDIX 2(d): Investigating Particle Behaviour : Answer Sheet

NAME OR CODE: _____

For each question (except No. 4) choose the best answer from those provided. If you consider b is best, shade thus:

Should you wish to change your answer, cross out your first choice and shade the letter you now consider best.

Page 1

1. a b c d e

2. a b c d

Page 2

3. a b c d

4. Tick Important OR not Important OR Unsure for each thing (a-i)

	Important	Not Important	Unsure
a			
b			
c			
d			
e			
f			
g			
h			
i			

5. a b c

6. a b c d

A scientist's view would be scored.

1 - a

2 - c

3 - workshop team need to decide

4 -

	Important	Not Important	Unsure
a	x		
b	x		
c	x		
d	x		
e	x		
f		x	
g	x		
h	x		
i	x		

5 - b

6 - d

APPENDIX 3: Some problems in learning : discussion sheets for Activity Five

(a) PROBLEM 1: There are problems with the lesson being one part of a series of lessons

> Lessons are perceived by pupils as isolated events while to the teacher they are parts of a related series of experiences.

Any single lesson tends to be part of a series of lessons which form the classroom programme for a particular topic. As such, they are viewed by curriculum writers and teachers as providing not only a particular experience for pupils and a specific influence on their views, but also as contributing to a set of related experiences designed to have a collective influence. Unfortunately, this broader perception of a single lesson is not recognised by some children.

This narrow focus of some pupils is of significance for teachers who draw heavily on previous classroom experiences when setting the scene for an activity at hand. Links which a teacher perceives as strong and obvious, especially if they relate to the ideas taught in previous lessons rather than to what pupils did or what happened, may be far from obvious to pupils whose concern is with what they will have to do today. Another aspect of this problem is that teachers refer to the past in terms of their own perceptions and unfortunately these perceptions are often not those of their pupils.

QUESTIONS FOR DISCUSSION:

1. To what extent is this problem true of the curriculum areas represented in the discussions group?

2. What methods can you suggest for overcoming this problem in your classes?

(b) PROBLEM 2: The lesson has a purpose

> The pupil perceived purpose for the task is not the teacher perceived purpose for the task.

It has not been uncommon to find that the teacher's perceptions regarding the purpose of a set task have not been matched by the perceptions of their pupils regarding the purpose of the task. A range of factors appear to operate to bring about this state of affairs in the lessons observed.

1. Some pupils who cannot or are not bothered to, perceive a purpose for the lesson limit their involvement to following the instructions. This frequently leads to actions which are expected by the teacher and is therefore an effective coping strategy. This strategy which apparently achieves the teacher's purpose, has a very low level of intellectual involvement.

2. Some pupils do not recognise the teacher's purpose for the lesson and consequently establish their own alternative purposes.

3. Some pupils who do not recognise the purpose, recognise the need to provide expected outcome and become concerned to "get the right answer".

4. Some teachers established purposes for a lesson which are "private" ie not communicated to the student. These private purposes frequently involved 'skills'.

QUESTIONS FOR DISCUSSION:

1. To what extent is this problem true of the curriculum areas represented in the discussion group?

2. What techniques can you suggest for dealing with this problem in your lessons?

(c) PROBLEM 3: The activity is designed with the teacher's purpose in mind

> Pupils' perceptions of the activity do not include an understanding of the critical design features but teachers assume they do.

To the teacher and curriculum writer the features of the various activities employed in lessons are clear and designed to elucidate particular aspects of interest: such people have a 'feel' for the activity itself and the nature of the outcome to expect. Pupils, on the other hand often have little or almost no feeling whatsoever for features in the design of an activity and consequently little appreciation of what to expect in the way of outcomes.

Unfortunately teachers do not often sense this problem; they give instructions which contain features but almost never elaborate on their significance. The effect of this on the pupils is to greatly increase the chance that pupils are distracted from the significant outcome of the activity towards secondary outcomes.

QUESTIONS FOR DISCUSSION:

1. To what extent is this problem true of the curriculum areas represented in the discussion group?

2. What techniques can you suggest for overcoming this problem in your classes?

(d) PROBLEM 4: Pupils have different views

> The views of pupils against which they consider the actions and outcomes of their lesson activities are not the views teachers' assume they have.

Teachers make assumptions about the views pupils hold in connection with the ideas that are associated with a particular activity or lesson. The economics of the classroom and syllabus may demand the making of assumptions. What seems clear is that the nature and extent of these assumptions are not appreciated by teachers.

Three aspects have been identified:

1. Pupils have 'views' that do not accord with the views a subject propounds about an activity;
2. Pupils lack assumed prerequisite knowledge.
3. Pupils are unable to understand the 'mental set', or perspective, required to deal with the material.

QUESTIONS FOR DISCUSSION:

1. To what extent is this problem true of the curriculum areas represented in the discussion group?
2. What techniques can you suggest for overcoming this problem in your classes?

(e) PROBLEM 5: Pupils have difficulty relating what they do and see to their thinking

> Pupils do not see the significance of their activities in the way that teachers assume they do.

Many factors operate to influence just what it is that pupils recognise as significant outcomes from a lesson. Many of these factors serve to reduce the influence of the classroom experience in altering the pupils viewpoint.

Even in situations where pupils appreciate:

- how the lesson relates to previous lessons;
- the teacher's purpose for the activity;
- the design features of the activity;
- the background against which the activity is being conducted;

they still do not necessarily have their child's viewpoint influenced in the way the teacher intended.

QUESTIONS FOR DISCUSSION:

1. To what extent is this problem true of the curriculum area represented in the discussion group?

2. What techniques can you suggest for overcoming this problem in your classes?

	Some possible mis-matches between teacher and pupil perceptions. It would be extremely rare for all these to occur in any one lesson		Some consequences of the mis-match (if it does occur)
RELATING TO SETTING THE SCENE OF THE LESSON:			
(a) The subject context of the lesson/activity	The lesson/activity is seen as part of a related series of experiences	The lesson/activity is seen as an isolated event	Pupils do not consider the lesson/activity against important prior experience
(b) The purpose of the lesson/ activity in terms of the subject	From the framework of your subject the lesson/activity's purpose is specific and obvious	The purpose of the lesson/ activity is not obvious	The pupil's guess at and invent what seems to them to be a reasonable purpose
(c) The design of an investigatory lesson	The activity has certain critical features which enable particular ideas to be tested and learnt about	The critical features of the activity are not recognised or understood	Pupils are unaware of which aspects of the activity need particular attention and why
RELATING TO PUPILS:			
(a) Doing the lesson/activity	What the pupils are to do is obvious and requires skills the pupils possess	What to do is not understood and the skills needed are not available	Pupils do things which <u>they think</u> are appropriate to reach the end of the activity
(b) Getting results	Pupils know what to look for and will recognise the result of the activity	What to look for is not clear and the significant result is not appreciated	Pupils focus on, observe and notice unexpected aspects of the activity. They are pre-occupied with "what is supposed to be the answer"
(c) Thinking about the lesson and its activities	Pupils will consider their actions and findings critically	There is no awareness that their actions, findings or answers should be critically examined	Pupils see the lesson/activity as "getting the right answer" or guessing what the teacher wanted from the lesson/activity
RELATING TO OUTCOMES ACHIEVED			
(a) Evaluation of the experience	Pupils will consider the experience against the ideas and perceptions of your subject	The experience is considered against the every-day ideas and perceptions the children hold of your subject	Pupils have difficulty in relating what they did to THEIR thinking
(b) Significance of the experience	There are predetermined out-comes which are significant for achieving the teacher's aim	The significant outcomes are not detected or detectable because they do not relate to toe personal view held	Pupils develop negative attitudes to the subject as being not relevant and BORING...

APPENDIX 5: Preparation for the Workshop

Thorough preparation and organisation are necessary if participants are to focus on the expected issues. A number of things need to be attended to prior to the in-service day.

A. State-of-mind preparation

The usefulness of the workshop will be enhanced if all future participants are given time to focus on the issue of learning in classrooms in a lead-up period. At Tokoroa High School Heads of Departments were encouraging to attend particularly to problems in learning and to the possibility of a workshop ten weeks before the in-service day. Six weeks before the in-service day - at a normal staff meeting - the issue of learning problems and the need for teachers to consider such problems in their teaching were foci for discussion. The programme for the in-service day and the workshop was announced two weeks before the in-service day.

B. Logistics and Materials:

1. Photocopying of materials for use in workshop activities. Appendices 1(a), 1(b), 2(a), 2(c), 2(d), 3(a), 3(b), 3(c), 3(d), 3(e) and 4.

2. Administering of 'survey of some ideas' to representative samples of Forms 3, 5 and 7.

3. A marking team (Tokoroa used selected 6 Form 'volunteers') needs to be established and marking procedures for both the 'survey of some ideas' and the 'survey of particle behaviour' set. The team can be introduced to procedures by marking and collating the Forms 3, 5 and 7 responses.

4. OHP transparencies of collated Forms 3, 5 and 7 responses need to be prepared. As do outlines for workshop overlays.

5. Three laboratories (rooms) need to be prepared for use with Activity two 'Investigating the behaviour of particles'. Do not forget 'pupils' need writing paper.

6. The workshop personnel need to be divided into equivalent groups (take into account age, sex, subject expertise, etc). Two groupings are required:

   (a) Three equal-sized groups: for Activity Two 'Investigating the behavoiur of particles'.

   (b) Groups of 6-8: for Activity five 'Considering problems in learning'.

APPENDIX 6: Suggested Workshop Timetable

TIME A.M.	Workshop Team	Participants	Marking Team
9.00	Give introductory talk.	Listen	
9.10	Introduce Activity one: Survey of some Ideas	Listen	
9.20	Administer survey	Do survey	
9.45	i) Introduce Activity two: 'Investigating behaviour of 'particles'	Listen	Mark answer sheets 'survey of some ideas' Collate responses, and prepare OHPT's
	ii) Announce groups 1, 2, 3		
	iii) Direct groups to lab (room)	Move to Appropriate room	
9.55	Set groups 'investigating'	Carry out investigation	
10.15	Administer survey on particle behaviour	Do survey	
10.30	Check on marking	M O R N I N G T E A	Mark answer sheets 'survey particle behaviour' Collate responses and prepare OHPT's
10.50	Activity three: Review survey of some ideas	Consider personal and other responses	
11.05	Activity four: Review 'Investigating particle behaviour'	Consider personal group and whole workshop responses	
11.25	i) Introduce Activity five: Considering problems in learning		
	ii) Announce groups	Listen and move to appropriate room	
	iii) Direct groups to rooms		
	iv) Announce report back time		
11.30	Consider, in light of perceptions of progress strategies for Activity six	Activiely discuss problems in learning	
12.00	i) Chair plenary session	Consider comments from other groups, comment as appropriate.	
	ii) Hand out summary sheet		